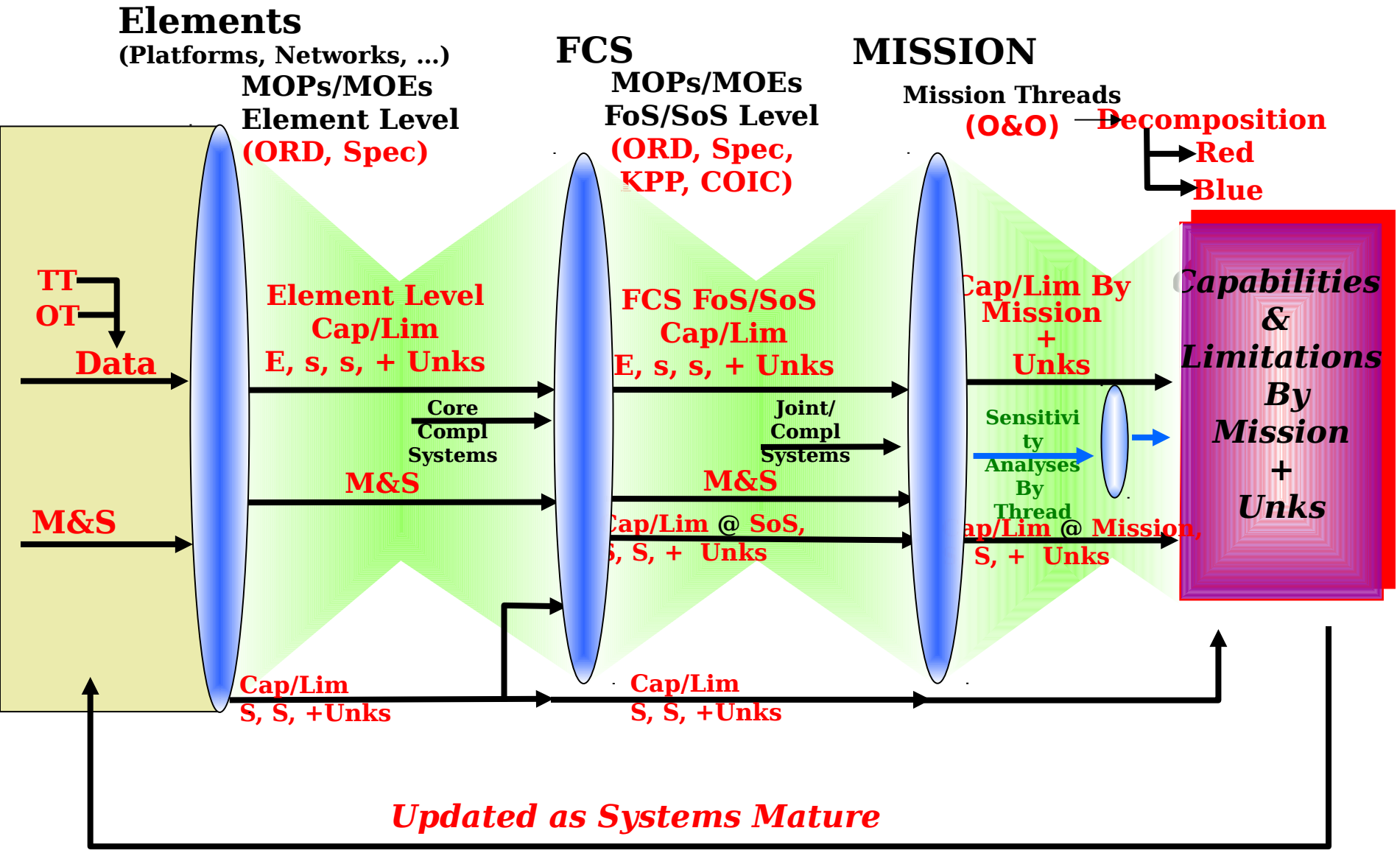
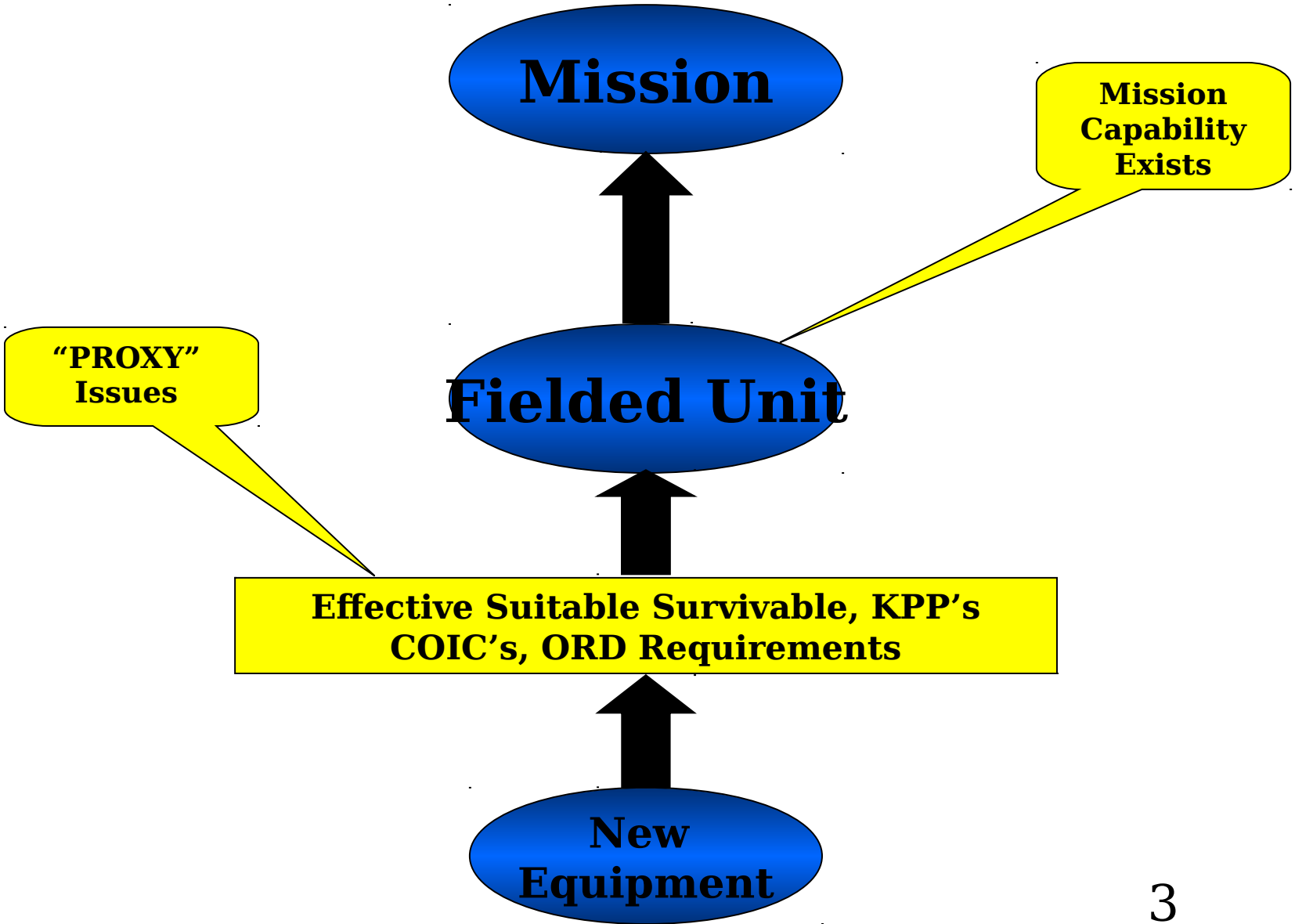
FCS ACQUISITION & EVALUATION TEAMING

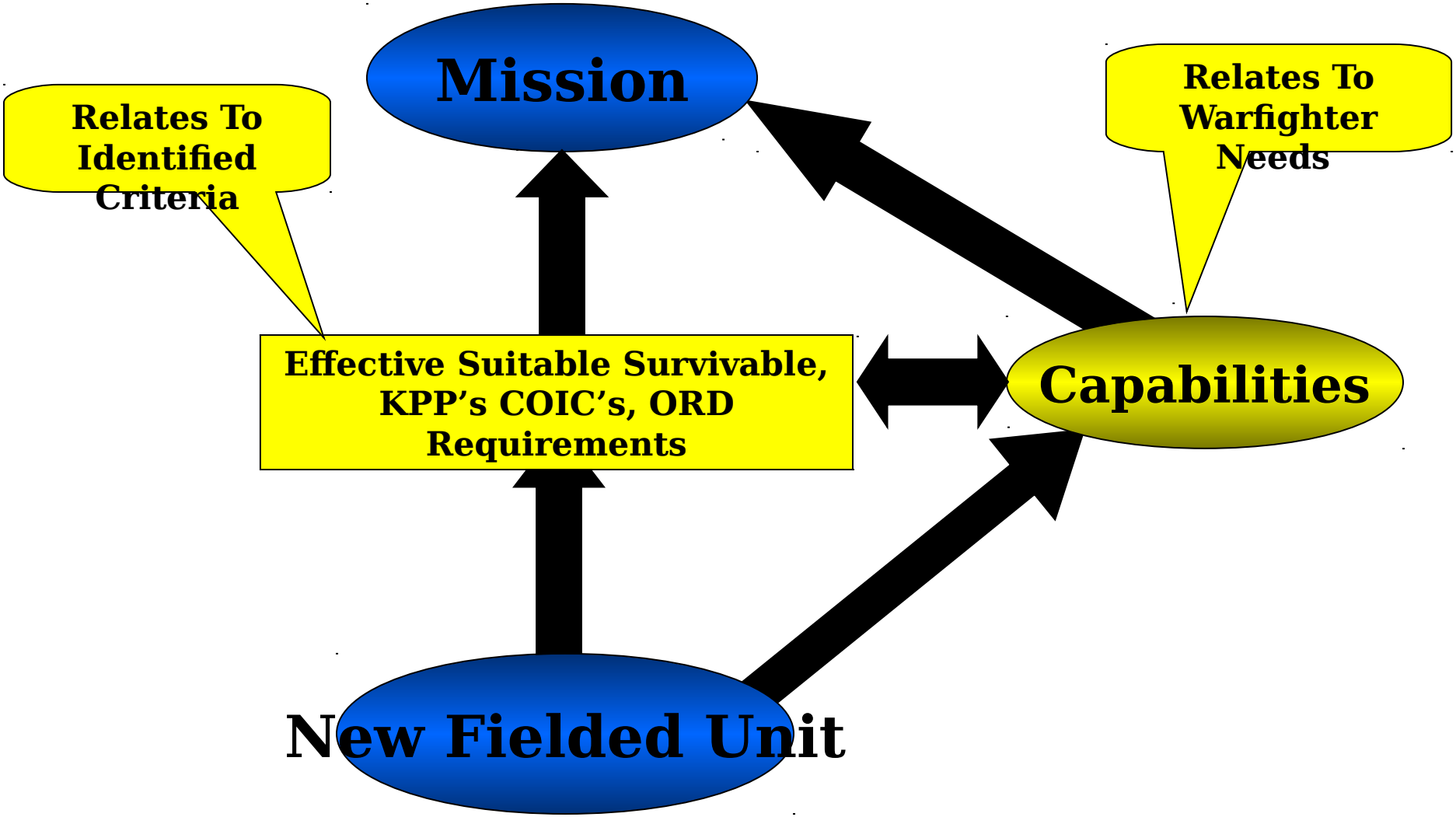
Evaluation Strategy



Traditional Acquisition Program



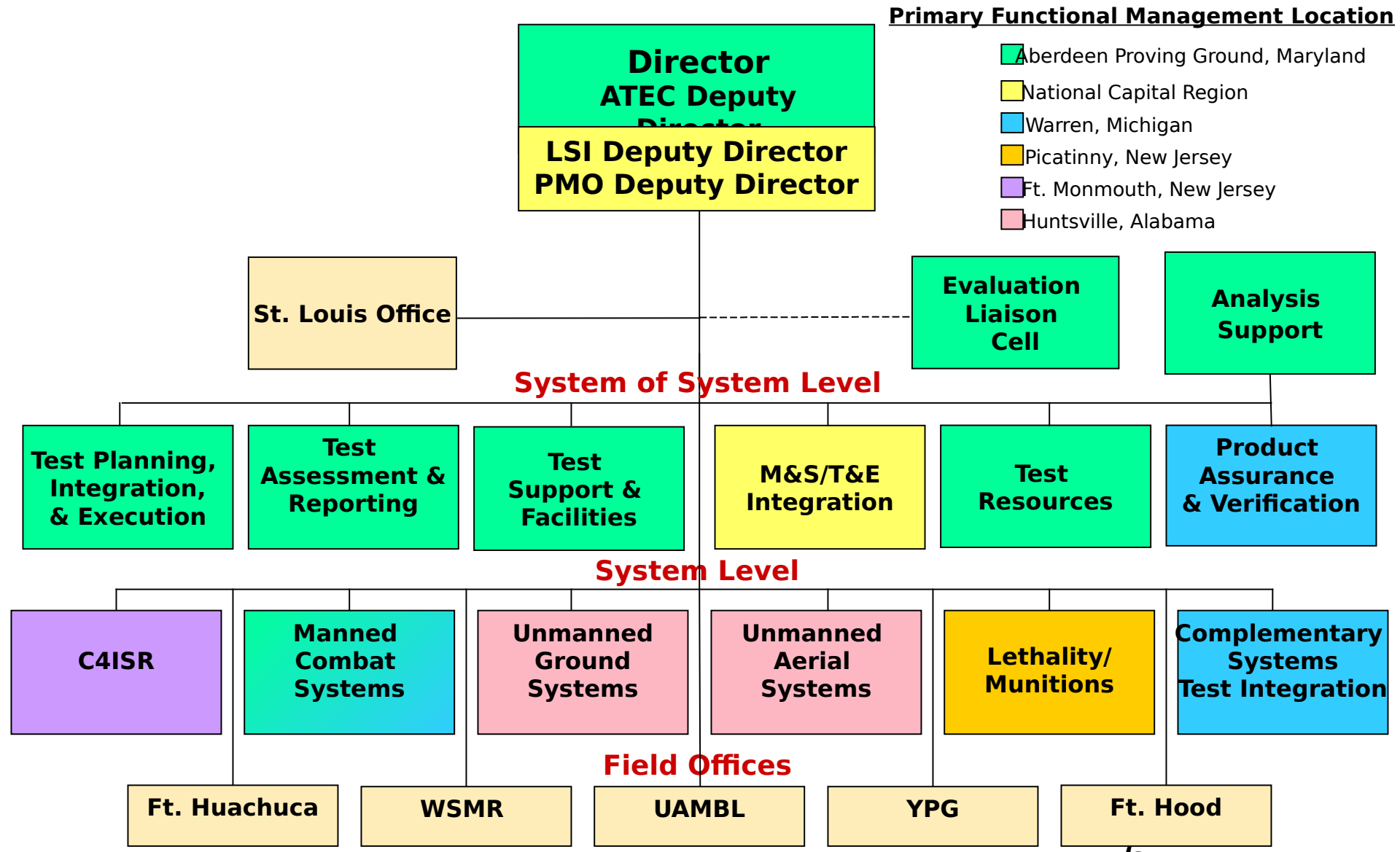
FCS Acquisition Program



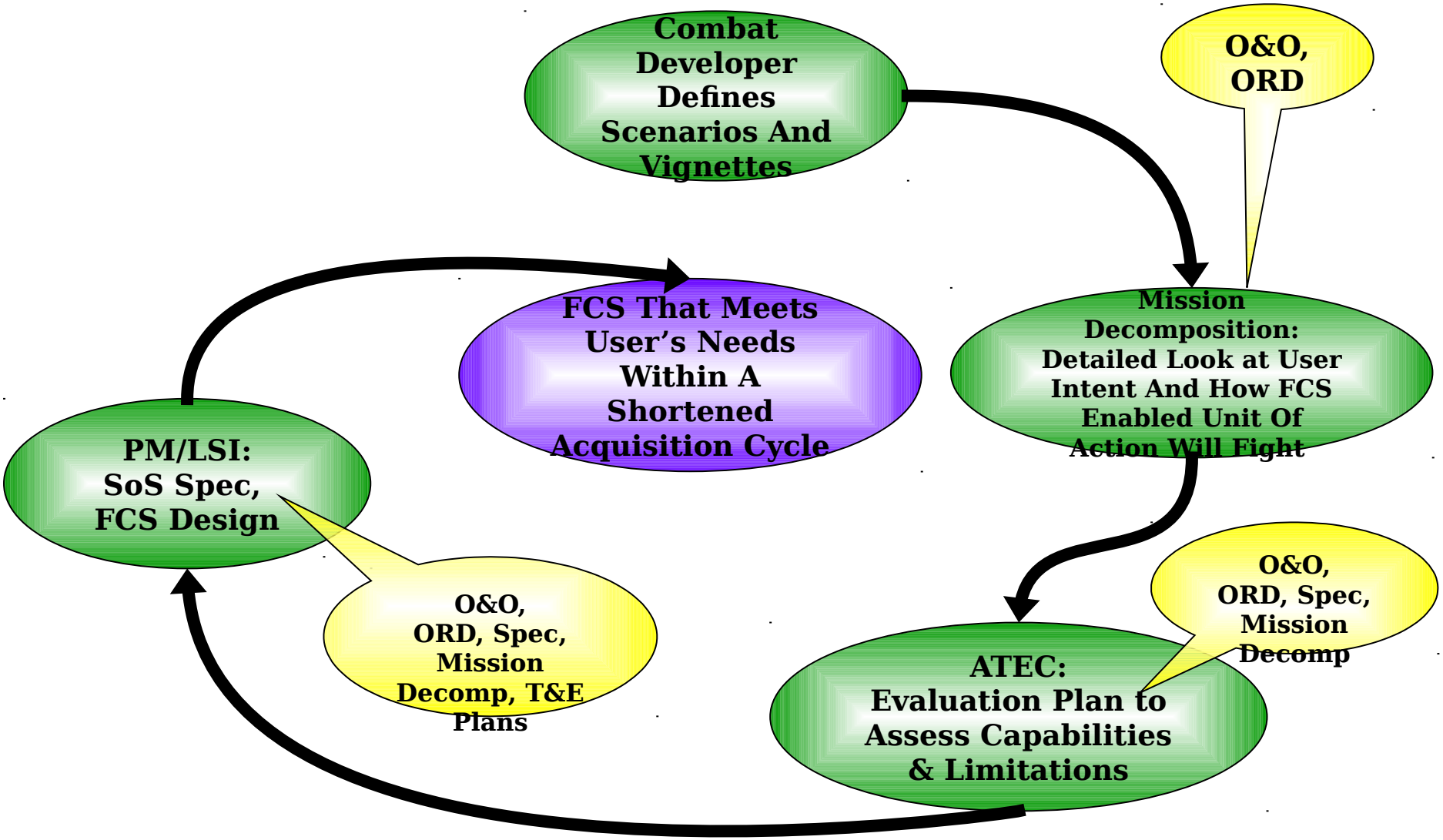
ATEC's Role

- Independent Evaluator For FCS
  - Develop MOEs And MOPs To Support Platform And FoS/SoS Assessment Of:
    - Specs
    - ORD Requirements
    - KPPs
    - COICs
- Address The Capabilities & Limitations Of The FCS Enabled UA Mission Accomplishment
  - Produce An Evaluation Of Whether The FCS FOS, In The Context Of The UA, Is Effective, Suitable, And Survivable
- Work In A Collaborative Environment To Maximize Commonality Of Resources & Ensure The Success Of FCS

CTO Organization

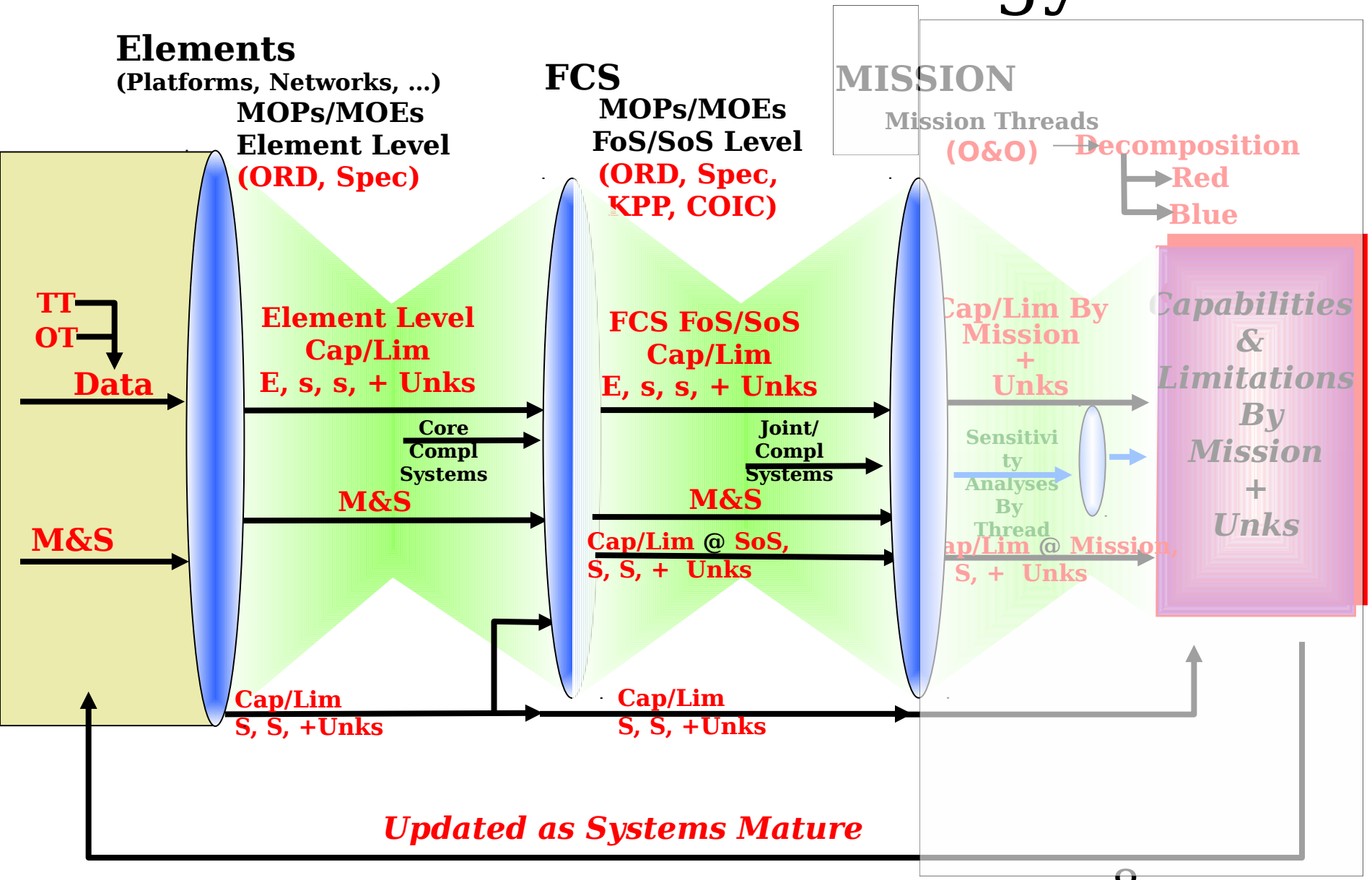


COLLABORATION PROCESS


Combat Developer Defines Scenarios And Vignettes
O&O, ORD
Mission Decomposition: Detailed Look at User Intent And How FCS Enabled Unit Of Action Will Fight
FCS That Meets User's Needs Within A Shortened Acquisition Cycle
PM/LSI: SoS Spec, FCS Design
O&O, ORD, Spec, Mission Decomp, T&E Plans
O&O, ORD, Spec, Mission Decomp
ATEC: Evaluation Plan to Assess Capabilities & Limitations

Plan Together, Test Once, Share the Data

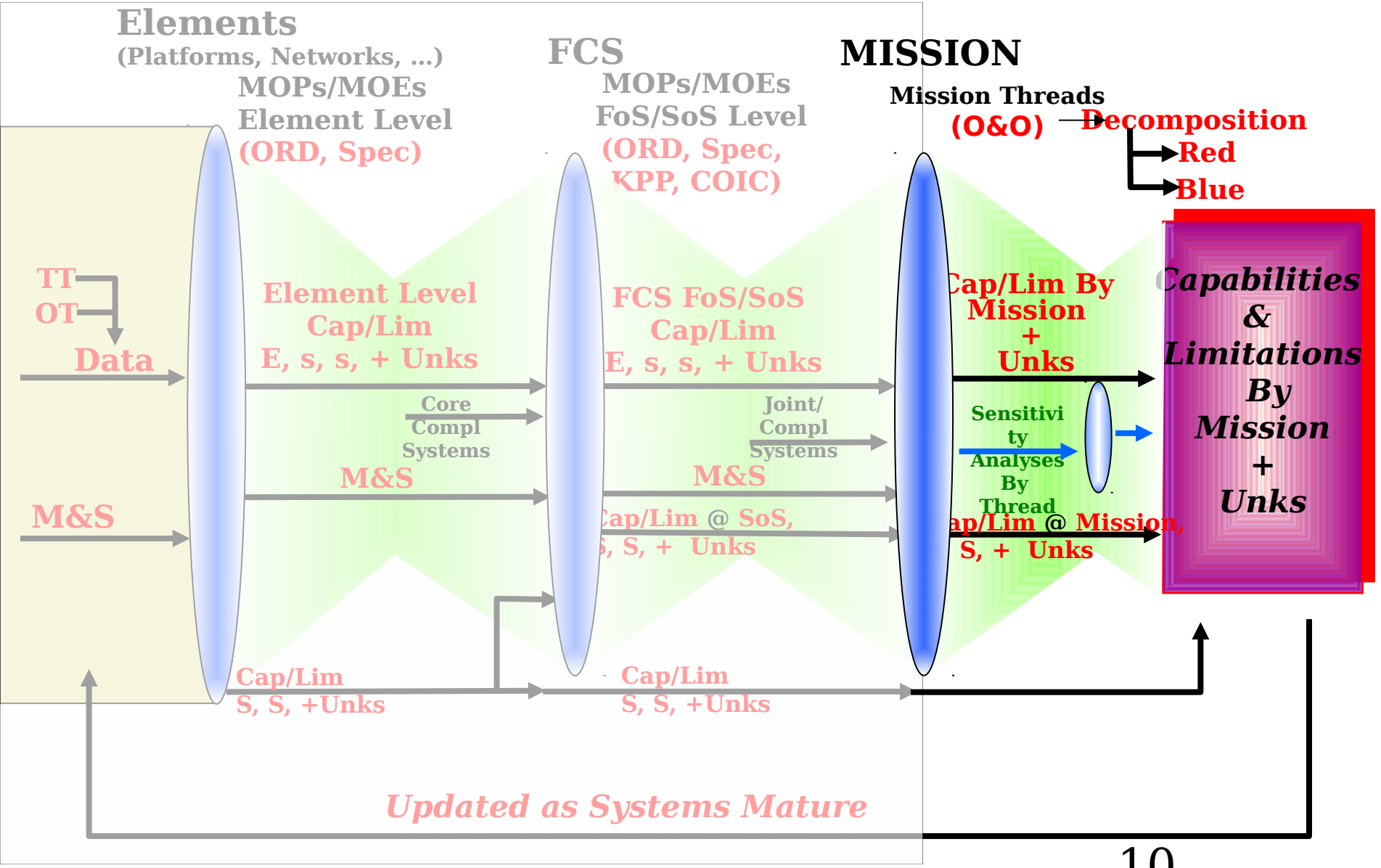
Evaluation Strategy



Platform/FoS/SoS Capabilities/Limitations

- MOEs, MOPs Based On COIs, ORD, KPP, AIs
- Platform Level
  - Based On Unique Platform Requirements
- FoS/SoS Level
  - Based On Synergistic Effects Of Multiple Platforms
  - Focused On FCS' Contributions To Capabilities
  - Requires Complimentary Systems To Execute FCS Test
- Basis To Determine Capabilities And Limitations At All Levels

Evaluation Strategy



Mission Capabilities & Limitations

- MOEs, MOPs Based on O&O, ORD,
- Based On Live, Virtual & Constructive Events
- Utilize Mission Decomposition Process To:
  - Assist In OT Planning
  - Correlate Capabilities And Limitations At Platform, FoS & SoS To Required Tasks
  - Determine Requirements For Force Effectiveness M&S
- Focused On FCS Contributions To Mission
- Sensitivity Analyses Conducted To:
  - Determine If Other FCS Or Complimentary Systems May Alleviate Shortfalls In Capabilities Caused By:
    - Technical Limitations
    - Environmental Influences (Including Threat Effects)
    - • • •
  - Enable Army Examination Of Alternate Scenarios/ Red Responses

Mission Decomposition

Missions
↳ Tasks

JTF

TASKS
1. Achieve air superiority
2. Destroy WMD capability
3. Facilitate control of energy centers
4. **Destroy resisting Rebel forces**

JFLCC

TASKS
1. Destroy WMD
2. Seize oil and gas pipelines and prod facilities
3. Seize the RHC fac of the IFP mil forces
4. Seize vital infrastructure with min coll damage
5. Facilitate the transition of power
6. **Destroy Rebel forces in zone**

UE1

TASKS
1. Seize RHC fac with min coll damage
2. Defeat Rebel forces W&S/W of Baku
3. **Conduct vertical maneuver to Baku**

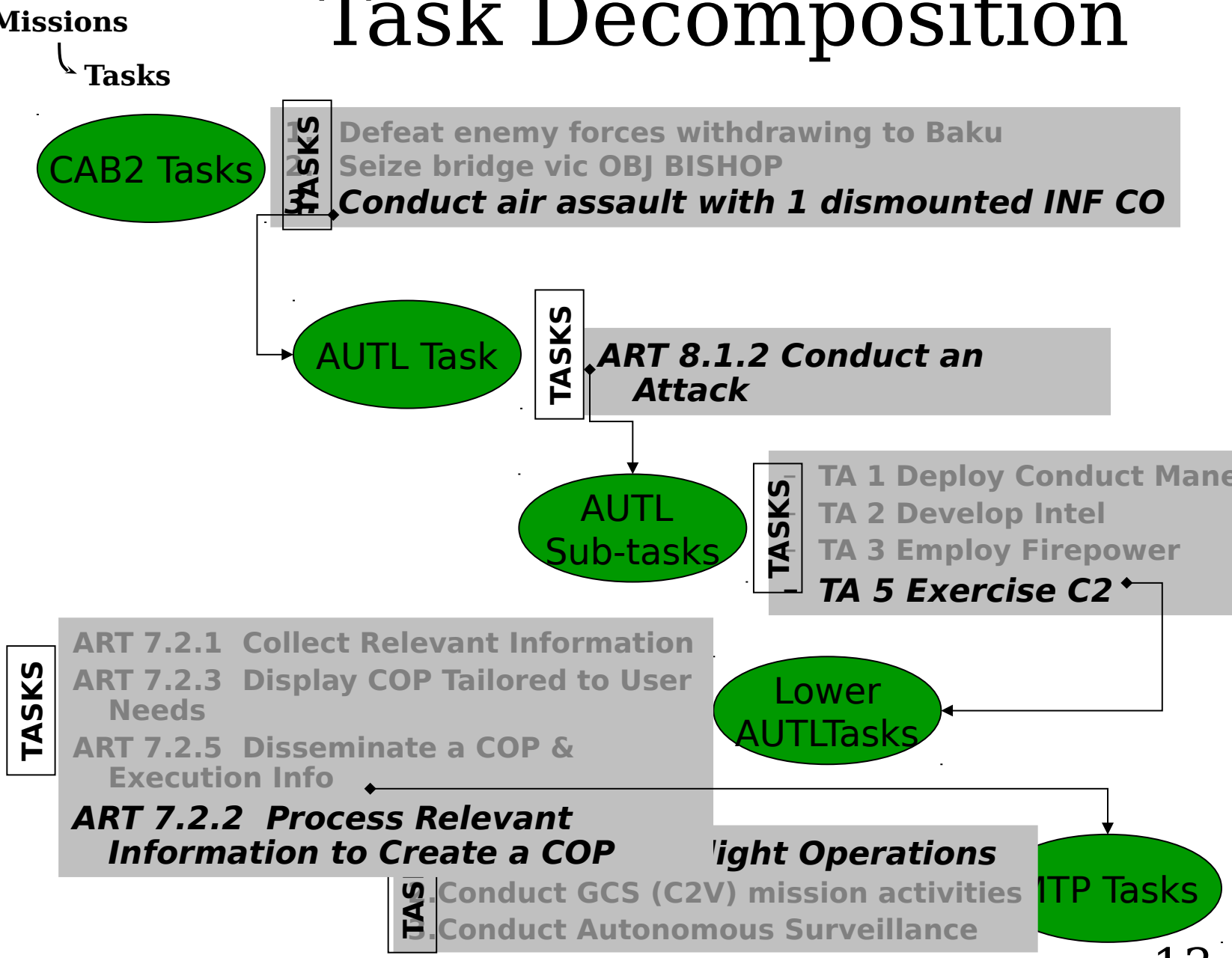
UA1

TASKS
1. Establish multiple FOBs, on order conduct
2. handover FOB security to 3d BN 504 PIR
3. Defeat rebel forces W/SW of Baku
4. **Secure OBJ CAMEL**

CAB2

TASKS
1. **Defeat enemy forces withdrawing to Baku**
2. **Seize bridge vic OBJ BISHOP**
3. **Conduct air assault with 1 dismounted INF C**

Task Decomposition



FCS Task to Functional Capability Mapping

Tasks

Capabilities

TASK	F8: Support mission planning/mission rehearsal	F10: Enable continuous estimate of situation	F11: Enable visualization of tactical scheme	F12: Enable dissemination of tactical scheme	F15: Enable continuous situational understanding through networked force	F16: Facilitate automatic language translation	F17: Enable information exchange via adaptive, integrated communications	F18: Detect/prevent intruders/malicious software; identify points of intrusion/origin, information compromised/introduced into the network	F19: Enable Positional Navigation (POSNAV)	F20: Enable information management to fuse, monitor and disseminate information to support CCIR, combat action, decision-making and analysis	F21: Establish an adaptive learning repository to build and manage a library of friendly and enemy DTLOMS and lessons learned	F22: Enable terrain analysis	F23: Integrate synergistic use of ISR to see the full range of operational variables	F25: Determine what is most dangerous
Manage Tactical Information		x	x		x	x	x	/		x			x	
ART 7.2.2 Process Relevant Information to Create a Common Operational Picture	/	x			x	/	/	x	/	x	x	x	/	x
Display a Common Operational Picture (COP) Tailored to User Needs		x	x	/	x	x	/	/		/				

FCS Functional Capability to ORD Requirements

Tasks

Capabilities

F15: Enable continuous situational understanding through networked force	2314	The FCS C4ISR network must provide dynamic, uninterrupted self-healing network connectivity. (Threshold)
	2365	The FCS C4ISR network must function within the speed and quality of service as specified in Appendix J. (Top Level IERs)
	2661	UAV systems must be capable of providing the operator the following in day/night/adverse weather from their operating altitude: system aerial location and magnetic heading information; sense a man; sense a tracked and wheeled vehicle; and assist with BDA.
	2869	The FCS FoS must have a capability to proactively populate selected operating areas with unmanned sentinels linked to specific effect-munitions throughout the battlefield that enable the commanders to set their own conditions for decisive action. Sensors are necessary that verify and maintain SU of the operating area and enable the commander to target specific enemy actions that may impede his mobility. These sensors must cross cue a wide range of munitions effects from extended ranges to enhancing force protection, facilitate transitions, enable economy of force, and contribute to battlefield shaping. A full range of munition effects (lethal and non-lethal) enable commanders to choose the effect that best suits the maneuver plan. (Objective)

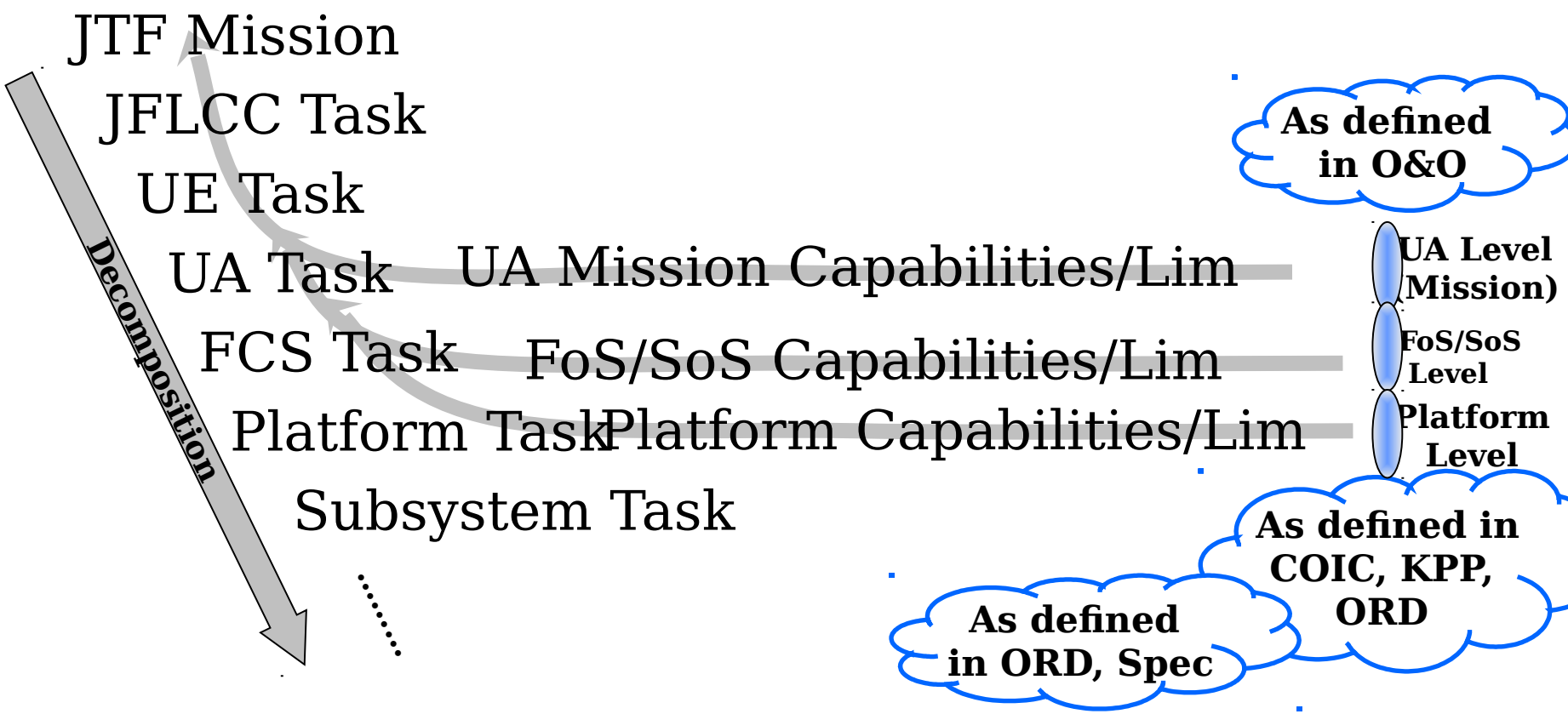
FCS ORD Requirements to Materiel

Capabilities

Materiel

ORD #	Requirement	Systems to Meet Rqt
2314	The FCS C4ISR network must provide dynamic, uninterrupted self-healing network connectivity. (Threshold)	Integrated Computers Network Management
2365	The FCS C4ISR network must function within the speed and quality of service as specified in Appendix J. (Top Level IERs)	Integrated Computers Network Management
2661	UAV systems must be capable of providing the operator the following in day/night/adverse weather from their operating altitude: system aerial location and magnetic heading information; sense a man; sense a tracked and wheeled vehicle; and assist with BDA.	Class I UAV Class II UAV Class III UAV Class IV UAV Situational Understanding SSS
2869	The FCS FoS must have a capability to proactively populate selected operating areas with unmanned sentinels linked to specific effect-munitions throughout the battlefield that enable the commanders to set their own conditions for decisive action. Sensors are necessary that verify and maintain SU of the... operating area and enable the commander to target specific enemy actions that may impede his mobility. These sensors must cross cue a wide range of munitions	Tactical UGS System Urban UGS System C2 Battle Command & Mission Execution SSS C2 Planning & Preparation SSS

Capabilities/Limitations Assessed At All Levels



Example Feedback to Be Provided to TRADOC and LSI Systems Engineering as a Result of this Endeavor thus far:

• **ORD 1215** - ”FCS FoS systems must be capable of automated precision engagements with automated fire control, distribution and clearance procedures with a manual back-up. (Threshold).” Rational paragraph indicates requirement enables “**rapid selection of high payoff and most dangerous targets while static or moving**”.

•**SOS Spec** - **no capability at SOS level in spec for “rapid selection of high payoff and most dangerous targets while static or moving”**; only addresses “rapid selection of high payoff and most dangerous targets” in paragraph 3.7.4.2.1.4.1 and 3.7.4.2.1.4.1 for threshold and objective requirements for MCS (ORD 3407) MCS. SOS Spec does not include ORD 3825 which indicates selection of high payoff targets requirement for ICV.

• **ORD 1159** – “FCS systems must accomplish **position/navigation** (horizontal and vertical) to a one meter Spherical Error Probable (SEP) with a Low Probability of Detection (LPD)/ Interception (LPI) and in the presence of electronic jamming. (Objective)”

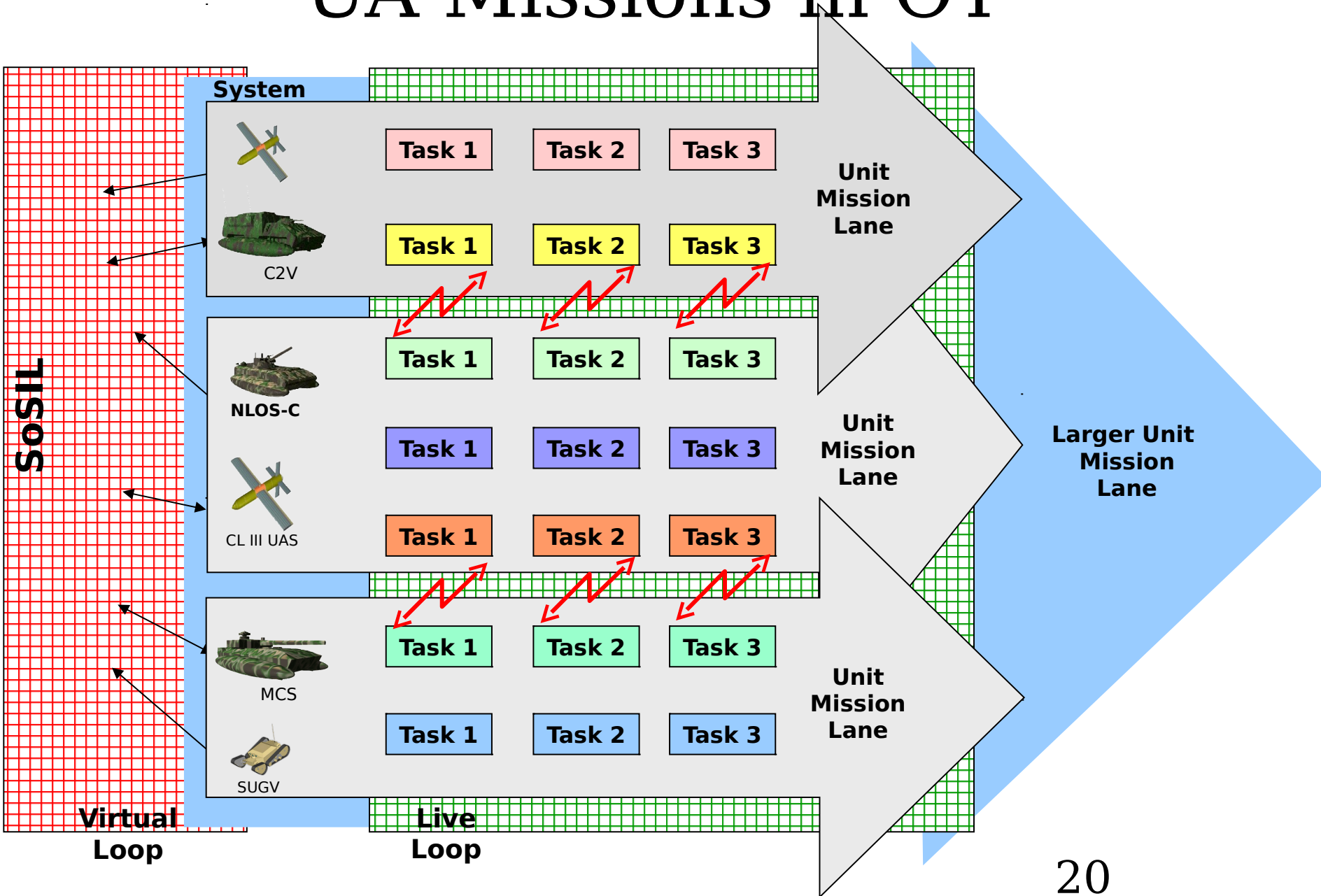
•**SOS Spec** - (3.2.1.3.2) **identifies requirement as Objective**. Only other references to navigation are 3.2.1.8.15.3.1- kit to enable legacy systems to be interoperable; 3.7.18.1- auto navigation for UAS CL I; 3.7.23.2.1.2.24 – UGS position themselves; directly enables 18 tasks from 3 missions, indirectly enables 37 tasks from 3 missions

• **O&O (SORC)** – Required Capability - **Terrain Analysis.** ORD addresses in 5.9.2 – no ORD Reference number; addresses in Appendix H, 2.5.1.3.1.1.6; Appendix F, Table 302; Appendix J IERs.

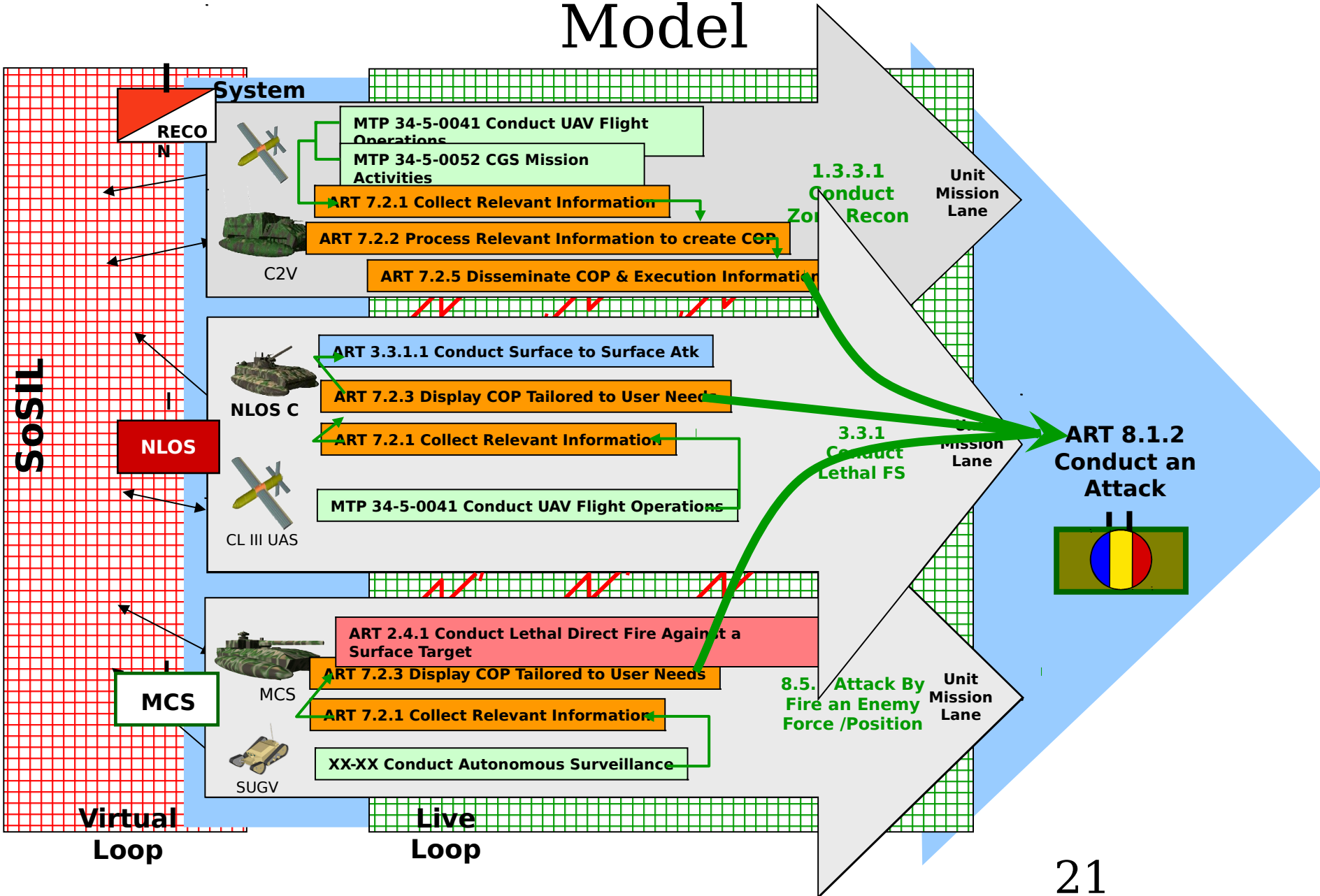
Applying Mission Decomposition & Capability Mapping to Construct Operational Test Events

Sample Application

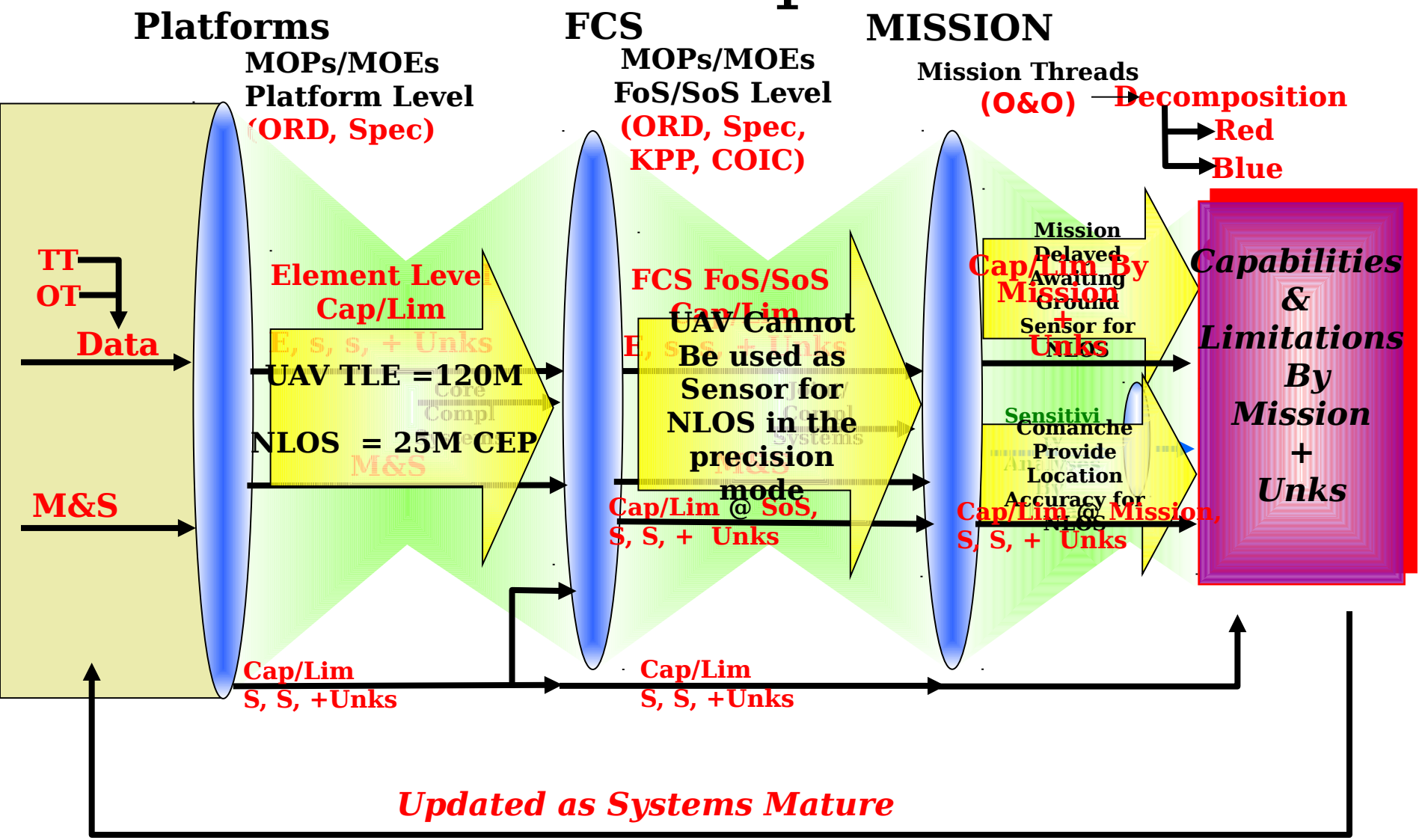
UA Missions in OT



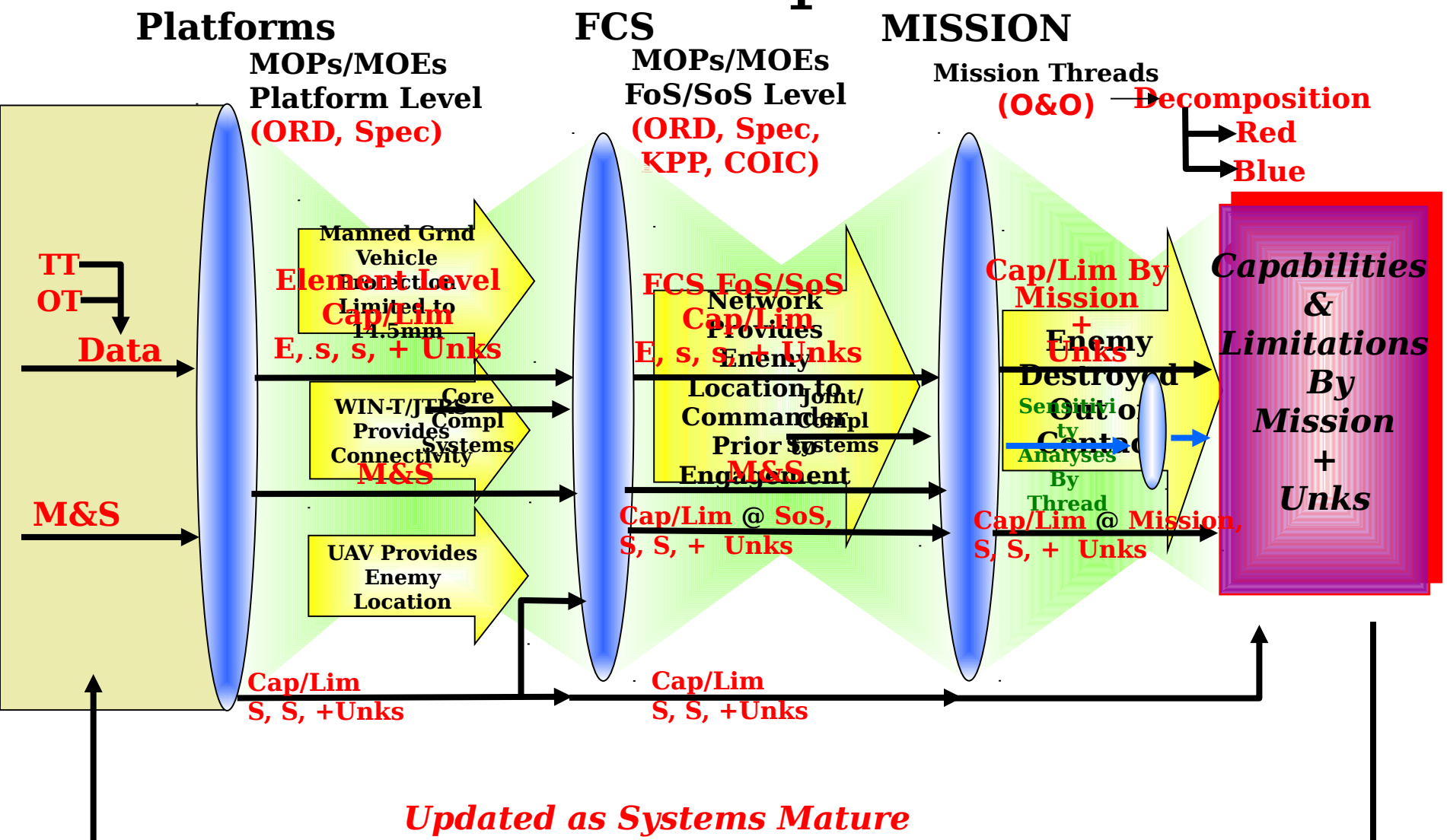
Sample Task Set Applied OT Model


System
RECON
MTP 34-5-0041 Conduct UAV Flight Operations
MTP 34-5-0052 CGS Mission Activities
ART 7.2.1 Collect Relevant Information
ART 7.2.2 Process Relevant Information to create COP
ART 7.2.5 Disseminate COP & Execution Information
C2V
1.3.3.1 Conduct Zone Recon
Unit Mission Lane
SoSIL
NLOS
NLOS C
ART 3.3.1.1 Conduct Surface to Surface Atk
ART 7.2.3 Display COP Tailored to User Needs
ART 7.2.1 Collect Relevant Information
MTP 34-5-0041 Conduct UAV Flight Operations
CL III UAS
3.3.1 Conduct Lethal FS
Unit Mission Lane
ART 8.1.2 Conduct an Attack
MCS
ART 2.4.1 Conduct Lethal Direct Fire Against a Surface Target
ART 7.2.3 Display COP Tailored to User Needs
ART 7.2.1 Collect Relevant Information
MCS
8.5. Attack By Fire an Enemy Force /Position
Unit Mission Lane
XX-XX Conduct Autonomous Surveillance
SUGV
Virtual Loop
Live Loop

Evaluation Strategy Example



Evaluation Strategy Example

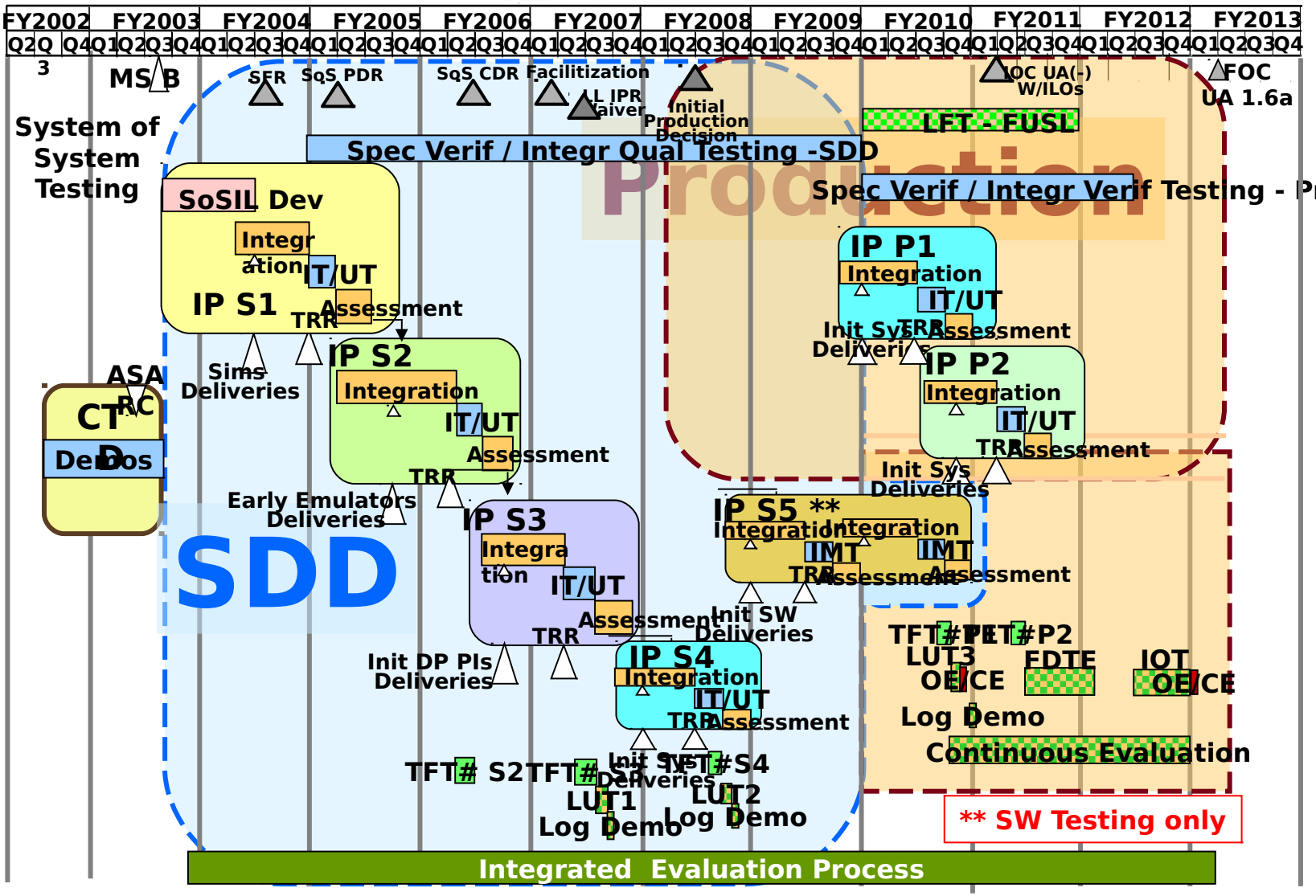


The Road Ahead

- TRADOC Complete Decomposition of 1st Mission
- TRADOC, ATEC, PM/LSI Identify M&S Requirements
- Develop Common Database For All Stakeholders
  - Identify All T&E Events
  - Include All Measures For Evaluation
  - Capabilities and Limitations Based
  - Evaluation of Data and Confidence Levels Continuously Updated

Backup

FCS Test Program Schedule



ORD - KPP Mapping

BASE ORD - Para 4 (Required Capabilities)

Responsiveness			Deployability				Agility & Versatility									Lethality				Survivability			Sustainability				
1020	1015	1021	KPP4	1016	1024	2947	KPP2	1159	1218	1215	1243	1036	3567	2869	3263	3719	KPP3	1182	2838	1248	KPP7	1268	2737	KPP5	2843	1240	KPP6	1093
Training							Interoperability					Testability			Log & Ready		ESOH										ara 5-C4I Stand	
3819	3341	3782	3783	3784	3786	3785	KPP1	1120	1148	3790	2850	3172	3173	3174	1239	3806	3791	3702	3703	3704	3706	3707	3708	3709	3813	2493	3710	3711

ORD ANNEXES

Battle Command C4ISR Annex A (68)				Leader Development Annex B (11)		Soldier Annex C (8)		ICV (17)	MCS (17)	NLOS Cannon (17)	NLOS Mortar (14)	R&SV (8)	C2V (3)	MV (25)		FRMV (8)	UAV (CL IV) (22)		UAV (CL III) (5)	UAV (CL II) (5)	UAV (CL I) (5)	ARV (34)		MULE (14)	SUGV (14)	ISR & MASINT (16)	CBRN (1)	UMASS (12)
2406	1073	3462	3755	3131	3128	3476	3216	1511	3405	3293	1700	1501	3394	3066	3096	2137	3658	3524	1414	1472	1473	1443	3845	1340	1359	3563	3078	3311
2408	2392	3463	3751	3122	3130	3475	3477	2684	3406	3297	1701	1498	2149	3068	3097	2245	3778	3775	1437	1492	3241	3839	3846	1341	1358	3280		3314
3159	2394	3464	3757	3123	3136	3214	3211	1508	3407	2205	2225	1500	3830	3074	3098	3396	3481	3529	1432	2591	3242	2689	3847	1339	1361	3281		3315
3160	2398	3465	1157	3133	3137	3215	3478	1514	2166	2202	2227	1499		3081	3099	3397	3482	3530	1421	2648	3243	3565	2530	1346	1356	3282		3316
3446	2413	3466	2314	3125	3138			1509	2157	2760	2229	3020		3083	3105	2141	3484	3532	3776	3746	3780	3828	2714	1347	1357	3283		3321
3447	3158	3467	2365	3126				1505	2156	2175	2723	3021		3087	3106	2138	3485	3534				2692	2537	1304	3777	3443		3323
3157	3750	3156	2368					1517	2155	2169	3725	1565		1641	1683	3723	3506	3535				3840	3826	1306	1308	3287		2611
3345	3754	3470	2395					1510	2158	2173	2221	3722		3092	3108	2139	3509	3444				3841	3827	1345	3448	3289		3327
1040	3752	3471	2488					1516	3231	2172	2215			1591	2192		3511	3538				3842	1352	1343	1307	3292		3325
2364	3756	3472	2501					1513	3589	3393	2216			1597	3113		3515	3541				2712	2523	3102	2833	3295		3326
2326	2467	3474	3153					2685	3408	2197	2224			1595	3114		3518	3546				2713	2528	1349	1364	3299		3329
3450	1064	2348	3753					2181	2976	3815	2278			3095	3109							1324	1453	2919	2832	3445		3331
2401	2464	2353	2355					3804	2986	2198	2725				1167							2542	2695	3116	2310	3076		
3453	2419	1139	1086					3825	2992	2199	2223											2531	2787	3111	1367	3836		
3458	1061	3266	3154					3805	2999	2204												2691	2792			3837		
1041	2358	2323	3479					2259	3412	2208												3843	2900			3290		
3749	2340	3155	3480					3721	3829	2207												3844	2902					

MANNED SYSTEMS (Annex D) (174)

Common Manned Systems (60)

1547	3303	1496	1535	1558	2830	1537	2758	1538
1542	1540	1541	2769	1534	3799	1554	1536	1553
1520	1519	1512	1579	1582	2847	2846	1669	1559
2827	3787	2778	2800	1068	1555	2512	2786	3204
2814	2821	3726	1269	1550	1560	2807	2810	2871
3234	3235	3236	3237	3238	3239	3800	3814	1503
1050	1046	2862	1084	1079	1097			

Combat Systems (5)

2873	1656	3822	2906	3715

Maneuver Sustainment

UNMANNED SYSTEMS (Annex E)

Common Unmanned Systems

3771	3772	3838	2952	1336	3152	3831	3833	3832

UAVs (8)

2661	1489	1477	2562	1423
1390	3147	3779		

UGVs (4)

2774	3773	2514	1354

UGSs (4)

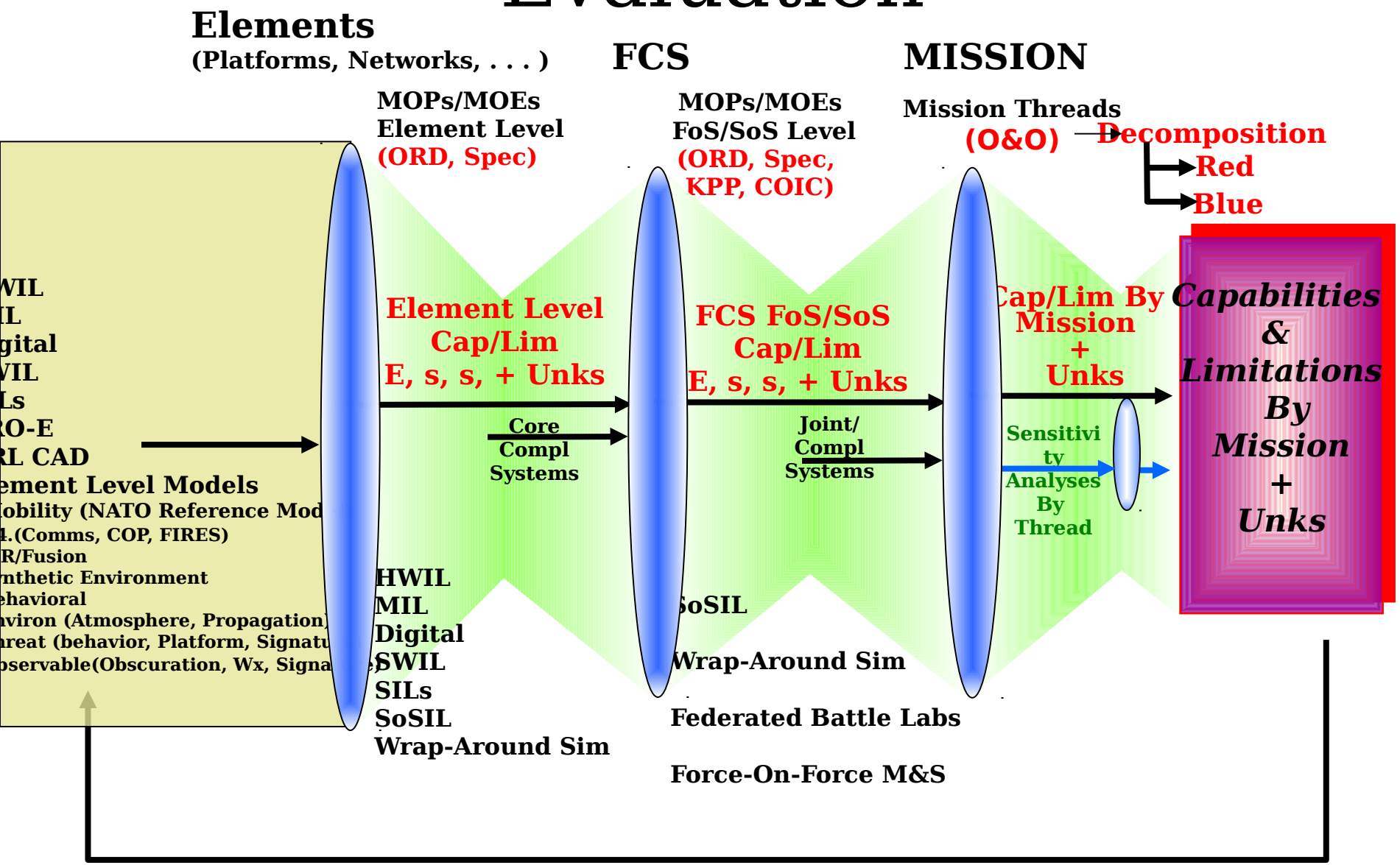
3148	3835	3276
3017		

- Responsiveness
- Deployability
- Agility & Versatility
- Lethality
- Survivability
- Sustainment
- Training
- Interoperability

As of 151700Apr03

Total # of ORD Rquirements (560)

M&S In Support of Evaluation



Updated as Systems Mature

Instrumentation & Facilities In Support of Evaluation